

Wired for Management 2.0 for Mobile PCs

MLB4

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Course Objectives

Course attendees will learn...

- What is Wired for Management 2.0 (WfM)
- What are the mobile requirements
- How to implement each WfM technology on a notebook PC

Agenda

- **What is Wired for Management?**
- **What are the requirements for mobile?**
- **WfM Implementation Guide**
- **Call to Action**
- **Questions / Comments**

Wired for Management

What is it?

- **Wired for Management (WfM) is an Initiative that focuses on standards-based management solutions for interoperability and building of intelligence into hardware platforms**
- **Wired for Management is a Baseline Spec. that defines the minimum level of manageability for enabled systems (Desktop, Mobile, Server)**

WfM has Broad Industry Participation

- 3Com Corp.
- Acer Incorporated
- Adaptec, Inc.
- American Megatrends, Inc.
- Bay Networks, Inc.
- Compaq Computer Corp.
- Computer Associates International, Inc.
- Dell Computer Corp.
- Fujitsu Limited
- Hewlett-Packard Company
- International Computers Limited
- Inference Corp
- International Business Machines Corp.
- Lanworks Technologies Co.
- Magic Solutions
- Mylex Corporation
- NEC Corporation
- Novell, Inc.
- Phoenix Technologies Ltd.
- Royalblue Technologies PLC
- The Santa Cruz Operation, Inc.
- SMC Networks, Inc.
- Siemens Nixdorf
- Sun Microsystems, Inc.
- Symbios, Inc.
- SystemSoft Corp.
- Tivoli Systems, Inc.
- Toshiba America Information Systems
- The Vantive Corporation
- Xircom, Inc.

WfM Terminology

- **ACPI** - Advanced Configuration and Power Interface
- **AOL*** - Alert On LAN*
- **BIS** - Boot Integrity Services
- **CIM** - Common Information Model
- **DMI** - Desktop Management Interface (from DMTF, Inc.)
- **IDCI** - Intel DMI Component Instrumentation
- **LAN Down** - LAN controller integrated on motherboard
- **PME** - Power Management Event
- **Pre-boot** - state of PC after power ON and before OS boot
- **PXE** - Pre-boot Execution Environment
- **WBEM** - Web Based Enterprise Management
- **WHIG** - Windows* Hardware Instrumentation Implementation Guide
- **WMI** - Windows Management Interface
- **WOL** - Wake on LAN*
- **WOR** - Wake on Ring

What's in WfM?

1.1a Baseline Technologies

- **Remote Wake-up [Wake on LAN (WOL)]**
 - ◆ Off hours maintenance
- **Preboot Execution Environment (PXE)**
 - ◆ Remote SW install and diagnosis
- **Power management - ACPI**
 - ◆ Enables remote wake-up
- **Instrumentation - DMI 2.0**
 - ◆ Asset Management

NEW WfM 2.0 Baseline Technologies

- **Remote Wake-up on Ring**
 - ◆ Off hours maintenance over the phone
- **Preboot Execution (PXE) from CardBus**
 - ◆ Remote SW install and diagnosis
 - ◆ Optional security - boot integrity services
- **Boot Integrity Services (BIS)**
 - ◆ Authenticated PXE
- **Instrumentation via CIM / WMI**
 - ◆ Asset Management
- **Problem Resolution Agent**

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WfM 1.1a Mobile Requirements

ACPI-enabled platform
(compliant components and
BIOS)

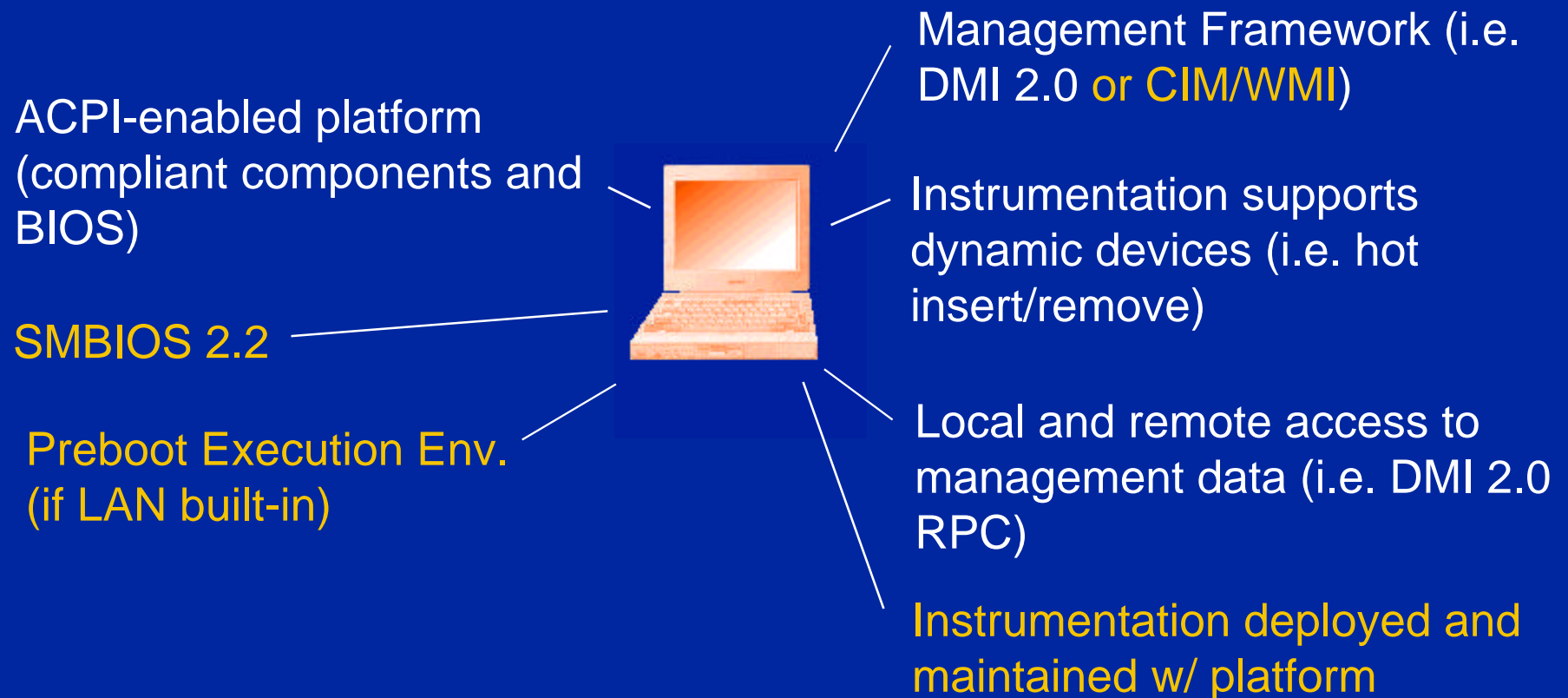


Management Framework (i.e.
DMI 2.0 instrumentation)

Instrumentation supports
dynamic devices (i.e. hot
insert/remove)

Local and remote access to
management data (i.e. DMI 2.0
RPC)

WfM 2.0 Mobile Requirements



Note: **Orange text** = new WfM 2.0 req.

WfM 2.0 Recommended Technologies

- PXE (for CardBus)
- Remote Wake-up
 - Wake on LAN
 - Wake on Ring
- Boot Integrity Services
- Problem Resolution Agent

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WfM 2.0 Design Guide

- A detailed “How-to” for each element of the WfM Spec. guides developers from piece parts, SDKs and building block products to create complete solutions.
- Design Guide on the web (<http://developer.intel.com/ial/wfm>) and on a CD-ROM for Sept IDF

WfM Implementation Guide

- Remote Wake-up
- Preboot Execution Environment (PXE)
- Management ASICs
- Instrumentation
- Problem Resolution Standards
- Management Applications

Remote Wake-up

What is it?

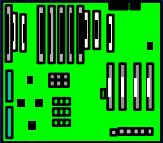

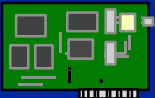
- Ability to remotely bring a PC to a fully-powered state in which all management interfaces are available, even when it is in a reduced-power state.
- Relies on system power management (ACPI).
- Examples: *Wake on LAN (WOL)* and *Wake on Ring (WOR)*

Remote Wake-up Consists of:

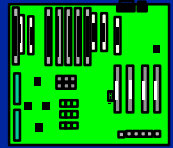
- 1. Power managed systems capable of reduced power state (e.g. ACPI S3).**
- 2. Power managed communications adapter (LAN or modem).**
- 3. Suspend power plane that provides suspend current to communications adapter when system is in low power state.**

Notebook WOL

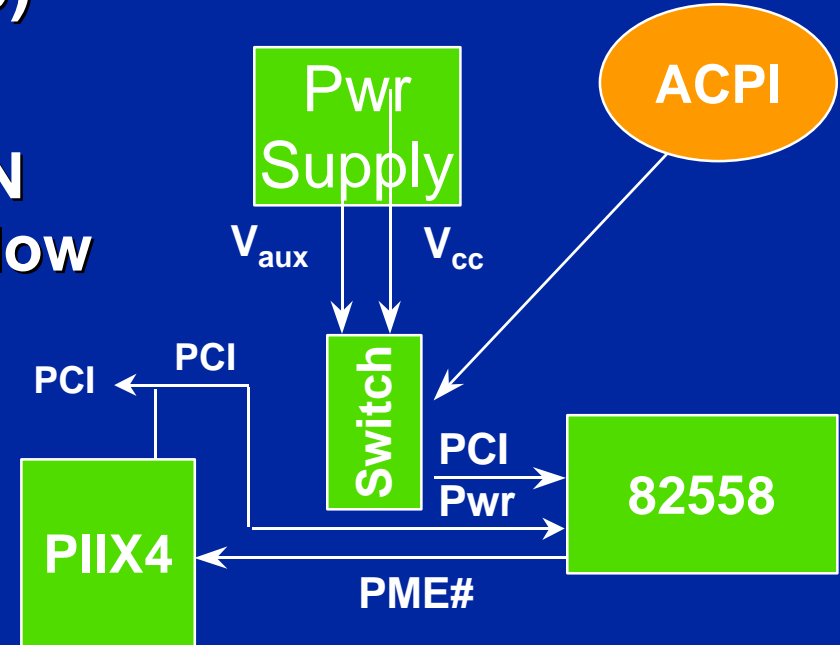
Implementation Choices

	Notebook	Dock	Port Replicator
 LAN on Motherboard	Intel 82559	Intel 82558 or 82559	Intel 82558 or 82559
 CardBus LAN Adapter	Intel® PRO/100 Mobile Adapter	Intel PRO/100 Mobile Adapter	N/A
 PCI LAN Adapter	N/A	EtherExpress™ PRO/100+ Management Adapter	N/A

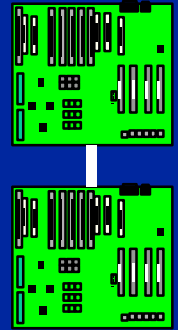
Notebook Motherboard WOL



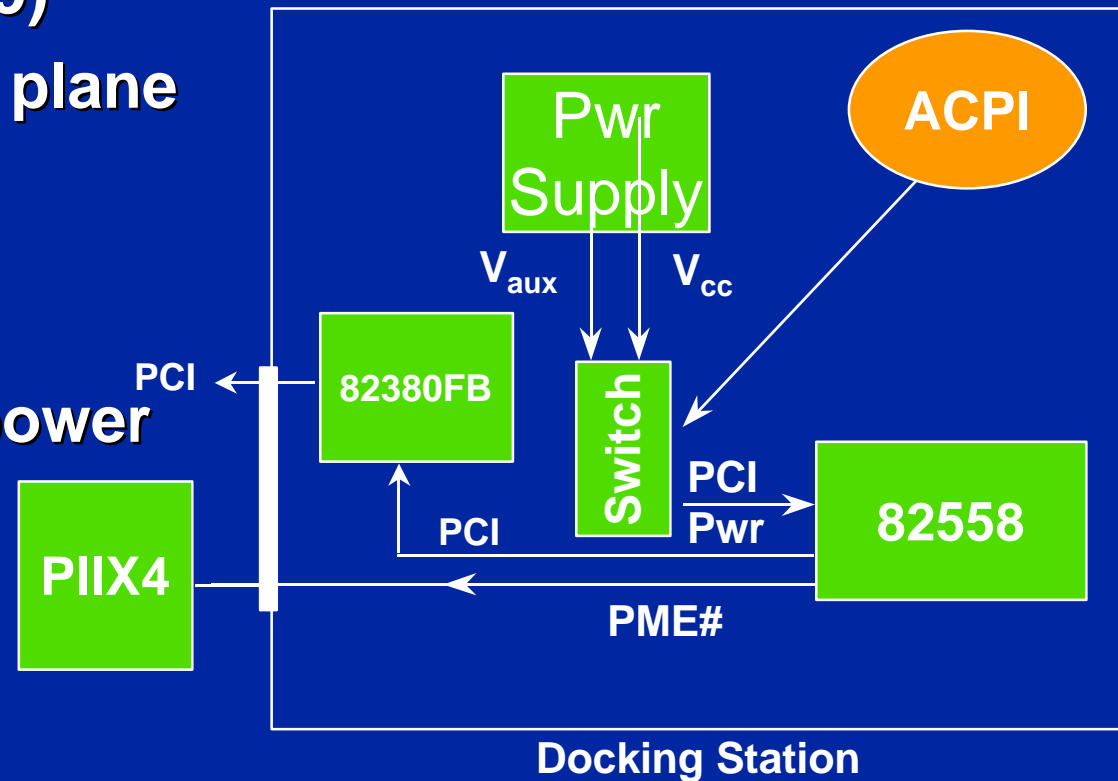
- Use 3.3v Ethernet controller with WOL (e.g. Intel® 82559)
- V_{aux} suspend power plane
- BIOS should provide a LAN disable feature to provide low power option
- Recommend ACPI power managed wake-up



Dock / Port Replicator Baseboard WOL



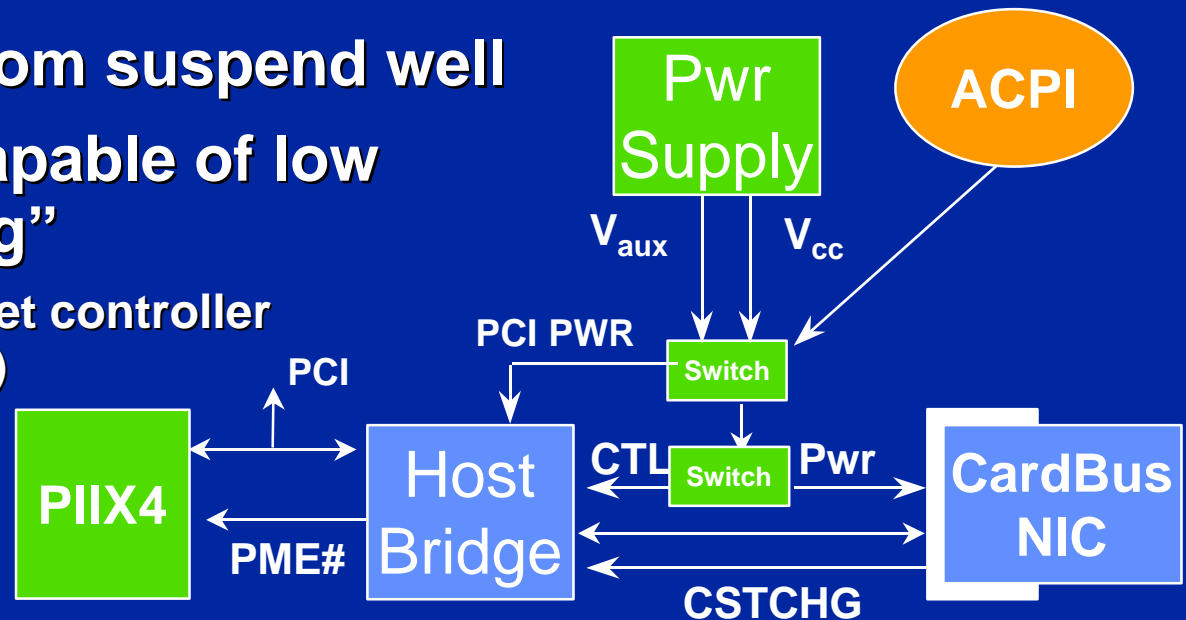
- Use 3.3v or 5v Ethernet controller with WOL (e.g. Intel® 82558 or 82559)
- V_{aux} suspend power plane in dock/replicator
- PME runs through docking connector
- Recommend ACPI power managed wake-up



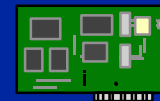
CardBus WOL



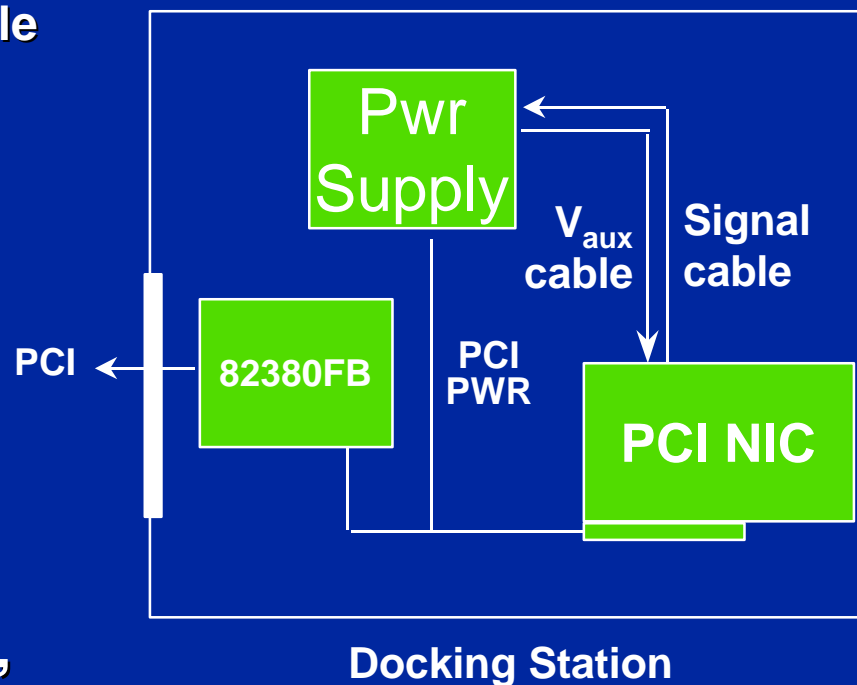
- CardBus PM Std - PCMCIA Spec, rev 6.1
 - ◆ “Keep slot powered during system sleep for card x”.
 - ◆ Generates a PM event
- Slot powered from suspend well
- CardBus NIC capable of low power “listening”
 - ◆ 3.3v WOL Ethernet controller (e.g. Intel® 82559)
- ACPI Required



PCI LAN Adapter WOL in Docking Station



- Use WOL PCI LAN adapter (e.g. EtherExpress™ PRO/100+ Management Adapter) w/ 3-pin cable
- Use V_{cc} / V_{aux} dual Power Supply
- POST must initialize PCI adapter cards in docking station
- Power ON of dock must power up notebook
- No ACPI / APM - “boot up”



WOL Software Support

WINDOWS* 95 <i>(for both LOM and PCCards)</i>	<i>Available - http://support.intel.com/support/network/adapter/21397.htm WOL capability using APM Backwards compatible with 82558 silicon</i>
WINDOWS* 98 <i>(for both LOM and CardBus Cards)</i>	<i>Available Now - http://support.intel.com/support/network/adapter/21397.htm Win98 driver kit includes workaround to support lack of ACPI Wake-up in OS. Backwards compatible with 82558</i>
Windows* NT v5 <i>(for both LOM and CardBus Cards)</i>	<i>MS plans Native Support for WOL in the OS NDIS5 Beta Version: Available now</i>

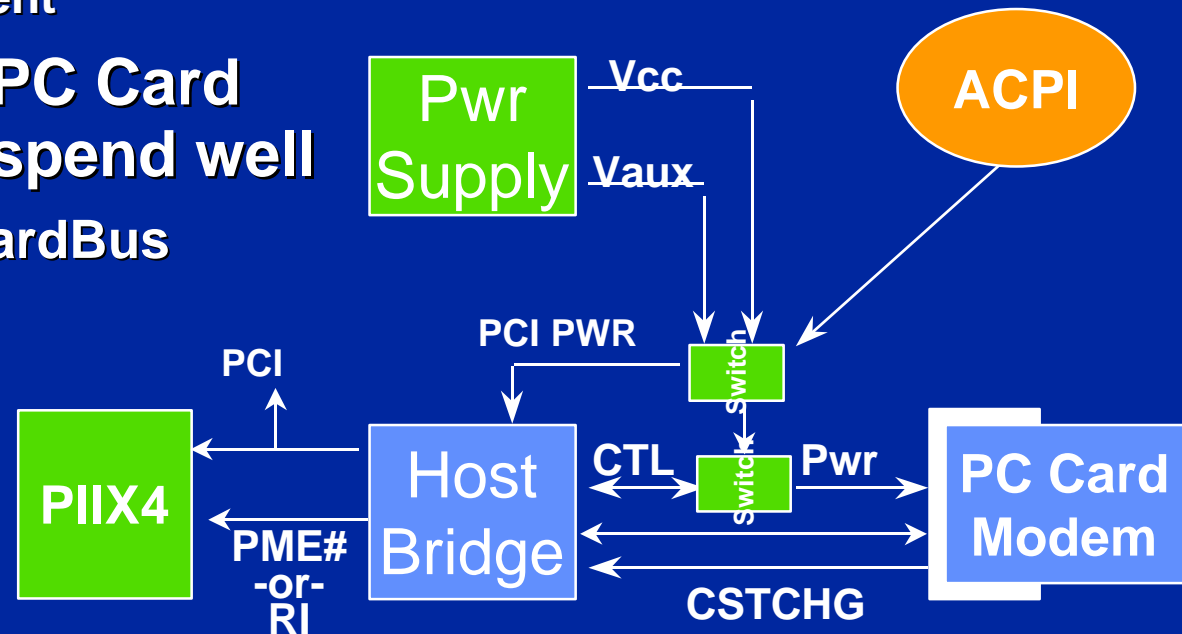
* Other brands and names are the property of their respective owners

WOL Hardware Products

- **Single Chip Ethernet controllers**
 - ◆ Intel® 82558 - 5V
 - ◆ Intel® 82559 - 3.3V, built-in CardBus support, 120mA-125mA with average traffic, > 5mA untethered (Recommended for LAN on Motherboard)
- **CardBus adapters**
 - ◆ Intel® PRO/100 LAN+Modem56 CardBus
- **PCI Adapters**
 - ◆ EtherExpress™ PRO/100+ Management Adapter

Wake on Ring

- CardBus PM Std - PCMCIA Spec, rev 6.1
 - ◆ “Keep slot powered during system sleep for card x”.
 - ◆ Generates a PM event
- Slot controller & PC Card powered from suspend well
- ACPI Required for CardBus modem



WfM Implementation Guide

- Remote Wake-up
- Preboot Execution Environment (PXE)
- Management ASICs
- Instrumentation
- Problem Resolution Standards
- Management Applications

PXE - What is it?

- PXE - Preboot Execution Environment¹

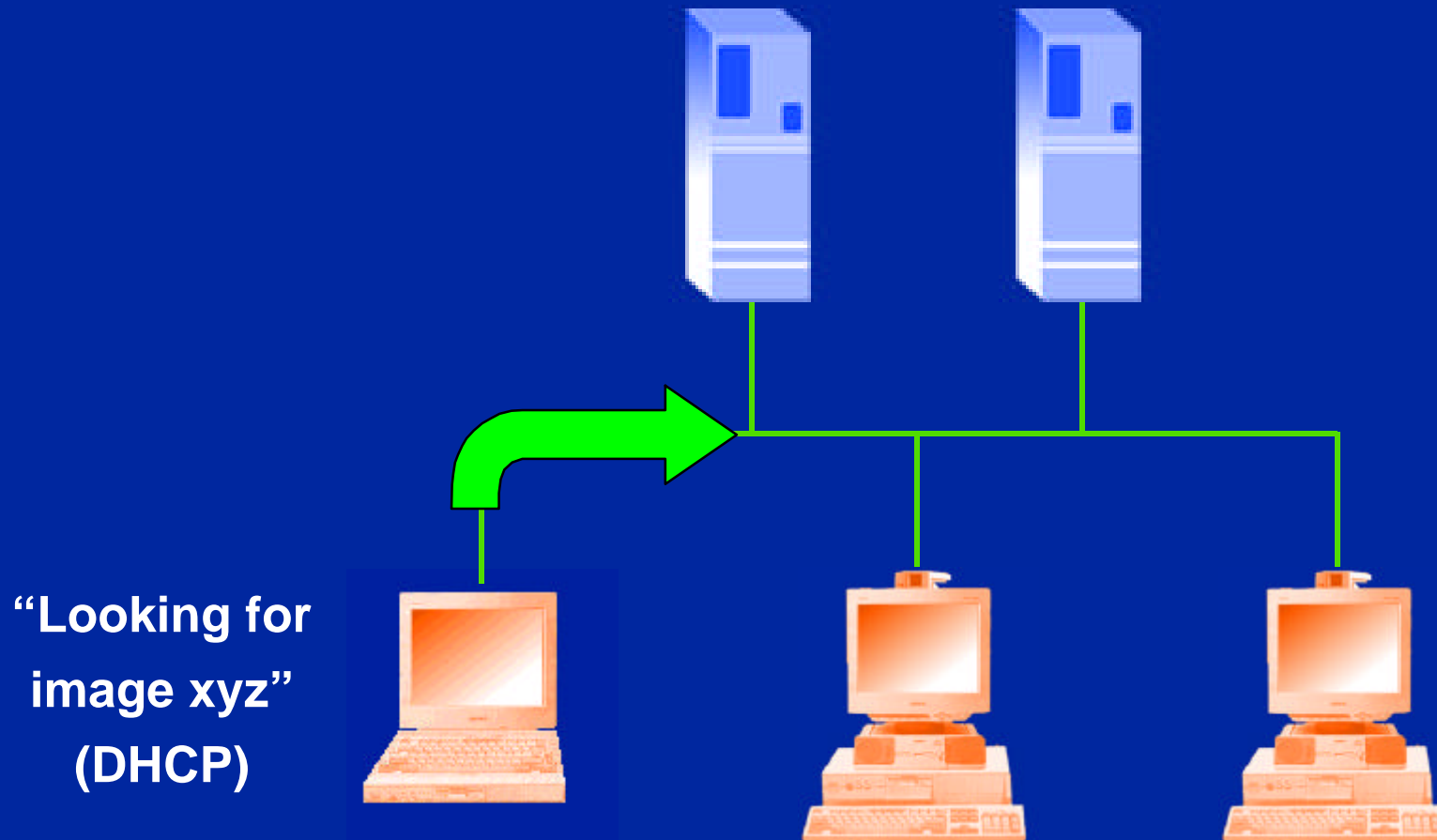
Enables remote configuration of all system software, from the operating system through drivers and applications, even without a formatted hard drive.

¹Also known as: Remote New System Setup, Service Boot, LANDesk® Service Agent (LSA), Universal Network Boot

PXE Consists of:

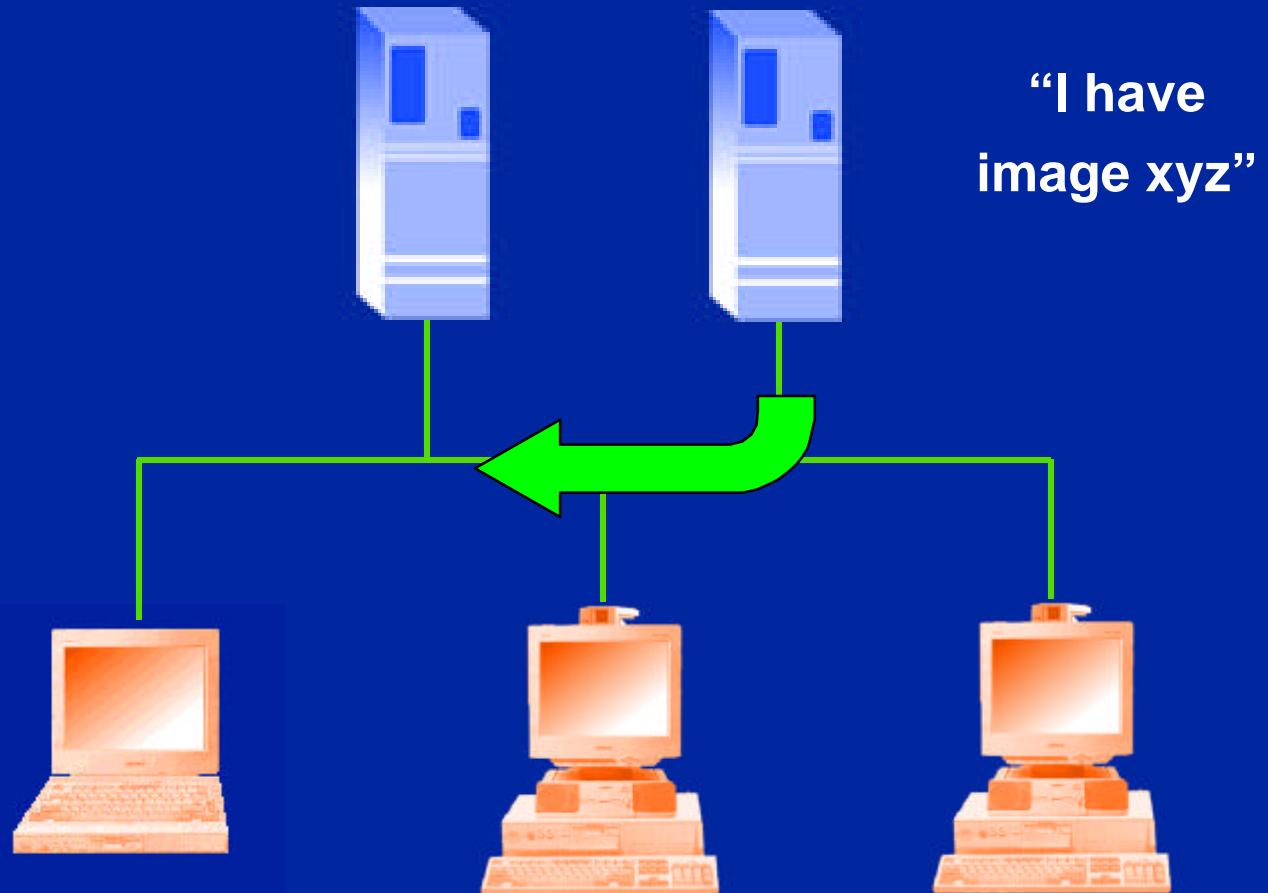
- **Client Service (Boot ROM)**
 - ◆ Makes the NIC a boot device
 - ◆ Provides APIs for bootstrap program
- **Protocol**
 - ◆ Uses DHCP and TFTP
 - ◆ Adds “vendor specific” tags to DHCP to define PXE-specific operation within DHCP
 - ◆ Defines Bootserver discovery based on DHCP packet format.
- **Services**
 - ◆ Bootserver
 - ◆ proxyDHCP
 - ◆ MTFTP
 - ◆ Plug-In Modules

How it works: Image Download via PXE



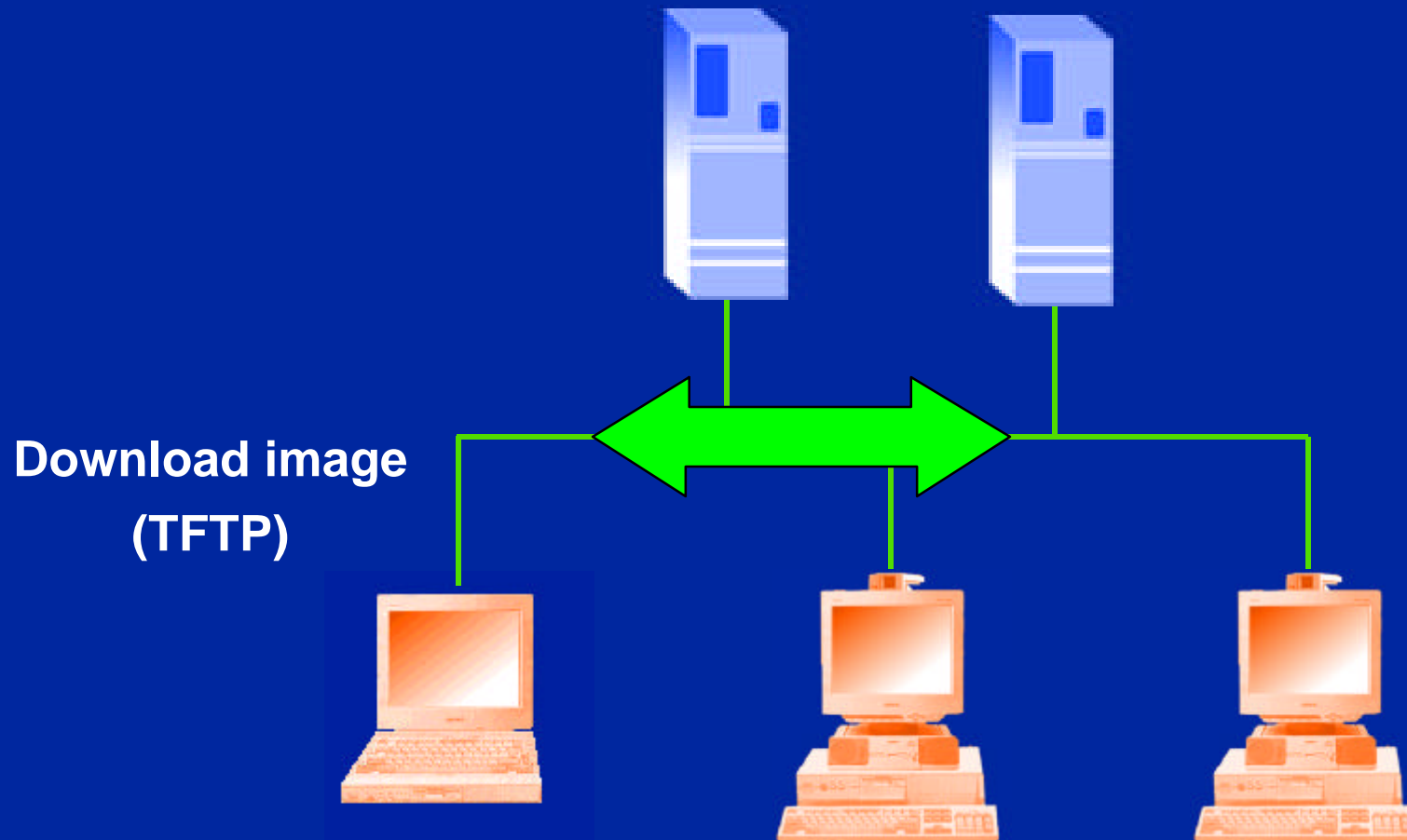
How it works:

Image Download via PXE



How it works:

Image Download via PXE



Implementation Choices: LAN on Motherboard PXE

BIOS:

- PXE code (~30K)

Electrical:

- Low power LAN controller (e.g. Intel® 82559 ~125mA)

Mechanical:

- RJ45 connector



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Implementation Choices: CardBus PXE

BIOS:

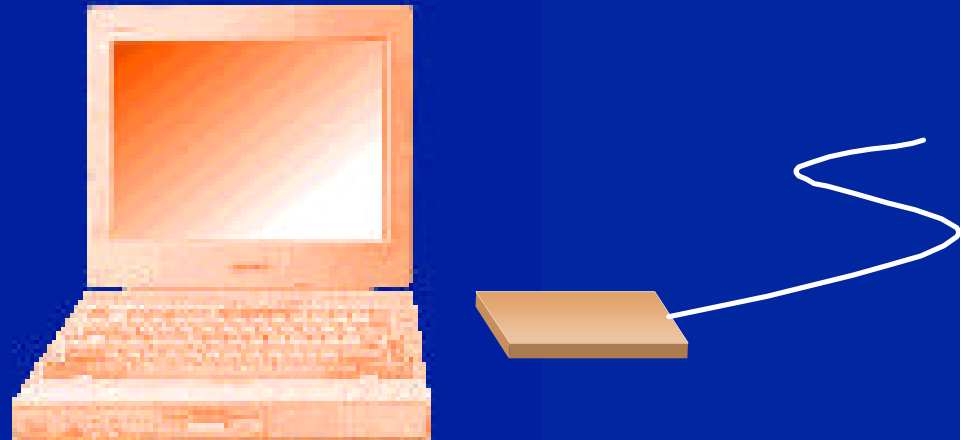
- PXE base code (~15K)
- BUSD code (~6K)

Electrical:

- (optional) Flash for NIC specific code storage

Mechanical:

- (no change)



CardBus LAN adapter:

- NIC Specific code (~9K) (stored in NIC option ROM or loaded into notebook flash)

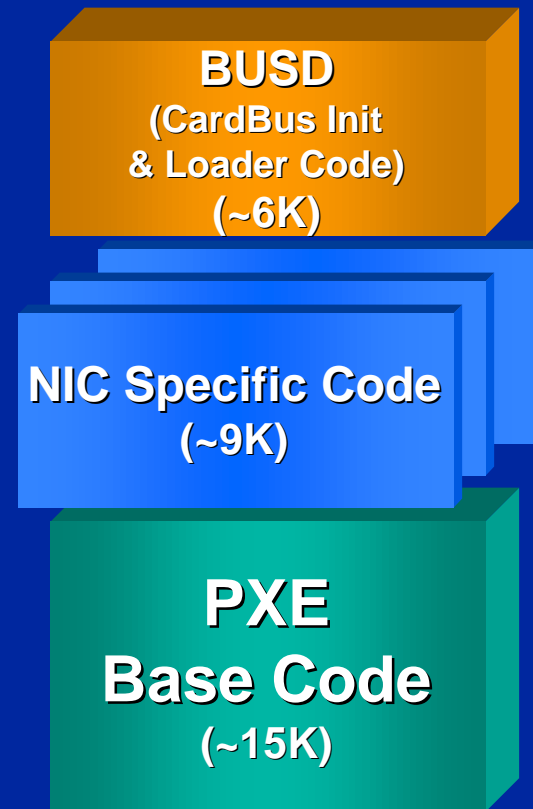
Requires Split-ROM PXE Architecture

PXE Boot ROM Architectures

Monolithic (WfM 1.1a)



Split-ROM (WfM 2.0)



Implementation Choices: PCI LAN Card in Dock PXE

BIOS:

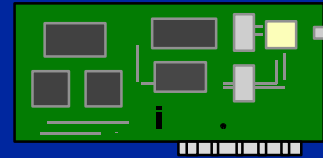
- SMBIOS

Electrical:

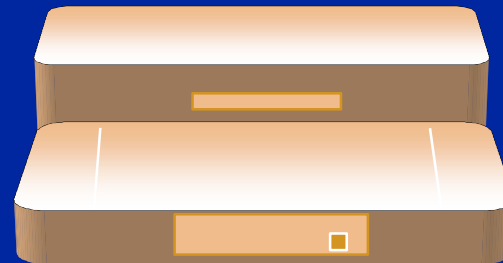
- PCI LAN Card w/ PXE option ROM

Mechanical:

- (no change)



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PXE BIOS Needs

- **Required**

- ◆ Plug and Play BIOS Specification v1.0a or later
- ◆ System Management BIOS (SMBIOS) v2.2 or later
- ◆ BIOS Boot Specification (BBS) v1.01 or later
[sections 3 and 4]

- **Recommended**

- ◆ POST Memory Manager Specification v1.01 or later
- ◆ Boot Integrity Services (BIS) API Specification v1.00 or later

PXE Security

Boot Integrity Services (BIS)

- BIS API reference implementation [customers: BIOS developers(OEMs and ISVs)]
 - source for top level functions
 - binary for core crypto routines
 - developer must implement platform-dependent flash access routines
- Digital signature utility for boot server (customers: mgmt app ISVs)
 - source code that assumes the existence of CSSM underneath
- Client configuration utility (customers: BIOS dev. / OEMs / mgmt app ISVs)
- Beta SDK ~end Q3'98, final ~Q4'98

PXE Related Specifications

- **Preboot Execution Environment (PXE) Specification v1.0** (<http://developer.intel.com/ial/wfm/>)
- **Boot Integrity Services Application Programming Interface v1.0** (<http://developer.intel.com/ial/wfm/>)
- **Network PC System Design Guides** (<http://developer.intel.com/ial/wfm/>)
- **LAN on Motherboard** (www.intel.com/network/oem/lom.htm)

PXE Products and Services

- **Intel PXE SDK** (*source*) (developer.intel.com/ial/wfm/tools/)
- **Intel PXE PDK** (*can test with*) (developer.intel.com/ial/wfm/tools/)
- **Intel EtherExpress™ PRO/100+ Management Adapter** (www.intel.com/network/blocks/)
- **Intel® 82558 Fast Ethernet single chip LAN controller** (www.intel.com/design/network/82558.htm)
- **Intel® 82559 Fast Ethernet single chip LAN controller** (ask your Intel field sales representative)
- **InCom*** (www.incom.de/)
- **LANWorks*** (www.lanworks.com/)

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Management ASICs

- Detect and report conditions that if not attended to could result in more serious failure or downtime.

Examples:

- Over temperature conditions
- Voltage/Current irregularities
- Cooling device malfunction
- Intrusion / tampering
- Unauthorized movement
- Software hang states

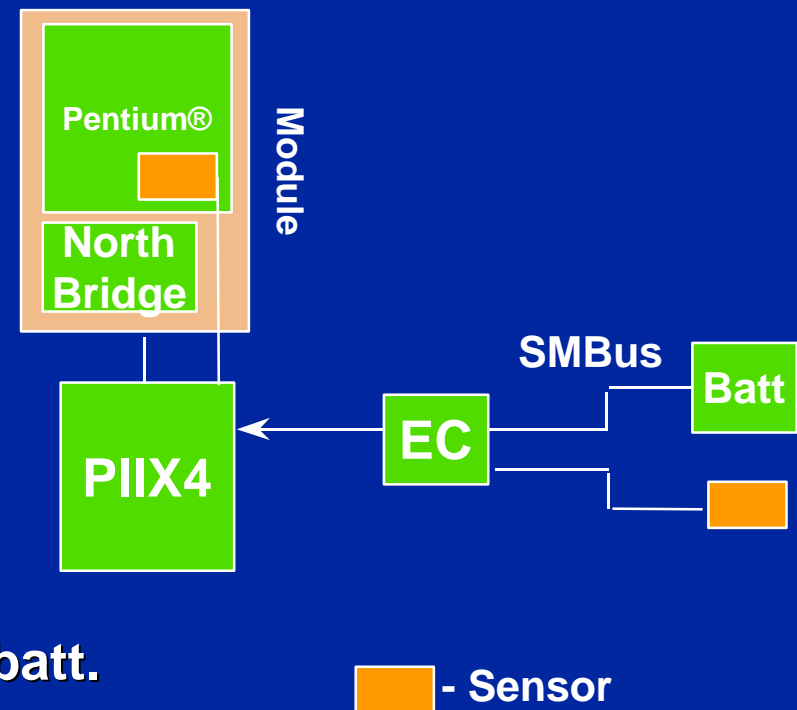
Thermal Sensors

- Choose sensor with appropriate power characteristics for mobile (3.3v, low power consumption)

Examples:

- Maxim* 1617 built into Mobile Pentium® II Processor
- LM75* built into Pentium® Processor Mobile Module

- Additional sensors up to you
 - ◆ e.g. baseboard, PC Card slots, batt.



Multifunction Sensors

- Single sensor for temperature, voltage, chassis intrusion, and fan.

Examples:

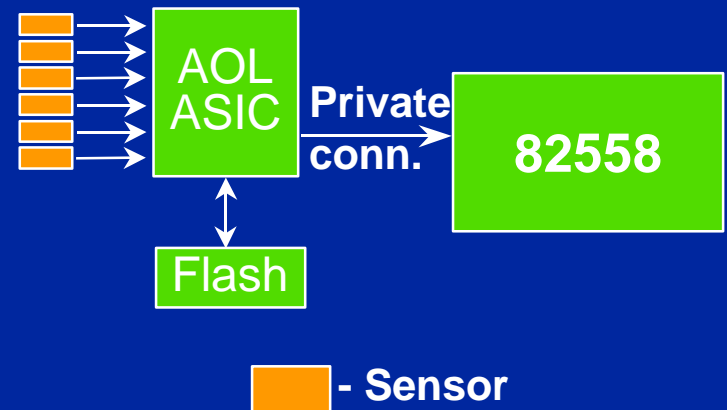
— National LM78*, LM79*, LM81*

- Choose sensor with appropriate power characteristics for mobile
- Some features unnecessary for mobile (e.g. chassis intrusion)

* Other brands and names are the property of their respective owners

Remote Alerting ASICs

- Sends alert out LAN controller based on input from sensors
- Input Examples:
 - Chassis intrusion
 - Processor missing
 - Over Temperature
 - Fan Failure
 - LAN Leash
 - OS Hang Watchdog timer
- Independent of client SW stack (except to program ASIC / Flash)
- Recommended only for LAN on Motherboard



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SMBIOS 2.2

- Provides foundation for OS present instrumentation (DMI & CIM/WMI)

Instrumentation

- **DMI v2.0**
 - ◆ **Service Provider**
 - ◆ **Component Instrumentation**
 - ◆ **Required DMI groups**
- **CIM / WMI**
 - ◆ **Comes with Windows* 98, NT* 5.0**
 - ◆ **Windows Hardware Instrumentation Implementers Guide (WHIIG) defines required content**

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Enabling Collateral

- **Smart Technology Enablers, Inc.**
(www.enablers.com)
 - DMI 2.0 Service Provider
 - DMI Component Instrumentation SDK
 - CIM-DMI/DMI-CIM Mapper
 - SNMP-DMI Mapper
- **Microsoft** (www.microsoft.com)
 - Windows* 98 and NT* 5 contain CIM object manager and WMI instrumentation

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Problem Resolution Standard (PRS)

- Enables standard trouble tickets
- Supports standards
 - ◆ Customer support consortium (CSC)
 - Solution Exchange Std (SES v1.0)
 - ◆ Desktop Management Task Force, Inc. (DMTF)
 - Service Incident Exchange Std. (SIS v1.0)
 - MOF Addendum (v1.0rc)
- To implement PRS get and load agent in your preload
- Agent available from *Smart Technology Enablers, Inc.* (www.enablers.com)

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Intel LANDesk® Client Manager v3.3

- Hot insertion and removal support
- Mobile DMI 2.0 instrumentation
 - dial up adapters
 - battery
 - AC line status
- Network status change detection
- Dial-up networking support
- Supports sensors and remote alerting ASICs

WfM Enabled Management Applications

- **Intel**

<http://www.intel.com/network/products/mgmt.htm>

- **Tivoli Systems**

http://www.tivoli.com/o_products/html/wfm_main.html

- **Computer Associates**

<http://www.cai.com/caprod.htm>

- **Hewlett Packard**

<http://www.openview.hp.com/index.asp>

- **Platinum Technology** <http://www.platinum.com>

- **On Technology** <http://www.on.com/>

WfM Testing

- **Self Test CD-ROM** (<http://developer.intel.com/ial/wfm/>)
- **WfM Interoperability Workshops**
 - ◆ **Test implementation vs. the spec (conformance) and also ensure interoperability.**
 - 1st Early Adopter interop workshop late Oct. '98.
 - 2nd in Q1'99 (initial target Feb. IDF) perhaps in conjunction with public spec launch/announcement/PR event.
 - Mass-market launch interop workshop in conjunction w/ product launches.
- **Intel Platform Support Lab (IPSL)**
 - WfM testing services
 - On-site support & In-house lab

Call to Action

- **Design WfM 2.0 into your 1H'99 business targeted notebooks**
- **Implement required features; Differentiate by adding recommended features**
- **Use the SDKs, design guides, and products** (<http://developer.intel.com/ial/wfm/>, see Intel field sales representative)

Question & Answer